

**CENTER FOR INDUSTRIAL RESEARCH AND SERVICE**

Partnering with the Iowa Manufacturing Extension Partnership

IOWA STATE UNIVERSITY

University Extension

IOWA STATE UNIVERSITY

College of Engineering



Check out pages 6 and 7 for a historical CIRAS timeline.

Celebrating 40 years of service to Iowa industry

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**Network of services helps company relocate**

By Clay Crandall, CIRAS

*Barry Nadler on the Mastercraft production floor.*

In February 2002, the Nadler Brothers Company bought Mastercraft Furniture, an 80-year-old Omaha-based furniture manufacturing company. Barry Nadler, who is president of Nadler Brothers and co-owns the company with his brother, James, wanted to move Mastercraft to a new facility in Council Bluffs, Iowa.

Nadler contacted the Council Bluffs Chamber of Commerce, which, in conjunction with various units, including CIRAS, the Iowa Manufacturing Extension Partnership (IMEP), and Iowa Western Community College (IWCC), worked with the Nadler Brothers Company to achieve its objectives.

Two noteworthy aspects marked the Mastercraft project: one was the economics and logistics of relocating and the other centered on the technical nature of determining factory layout and equipment placement prior to moving.

Assistance provided in these areas saved the company costs, speeded up the moving process, and significantly contributed to growth and expansion plans for the future.

**Relocation creates jobs**

Mastercraft's move from Omaha meant 50 new jobs to the Iowa economy and an initial investment of over \$2 million in plant operations and equipment. The positive outcome of the project was due in part to cooperation between the Chamber of Commerce and several economic development and technical assistance units in Iowa.

Council Bluffs Chamber of Commerce business development director Mark Norman contacted Clay Crandall at CIRAS. Crandall worked with IMEP account managers Don Reiner and Robert Coacher and IWCC executive director of business and industry Mark Stanley to develop a plan of action for Mastercraft's move. Stanley introduced Nadler to IWCC's new jobs training program, which generates funds for recruiting and training new employees in Iowa.

"The advantage of working with IWCC or any other community college is that we are active players in both the economic development and consulting/training arenas," explains Stanley. "We assist in the recruitment/expansion phase of the project, and we also have resources for ongoing training and consulting to help companies remain competitive and grow."

Reiner and Crandall, meanwhile, discussed with Nadler the feasibility of using Lean practices and factory flow concepts to boost productivity, for which a plan was developed and presented to Nadler. Once the financial issues of relocation were sorted through, Nadler decided to proceed with the CIRAS proposal.

**Technical assistance saves cost**

Mastercraft was moving from a sprawling plant

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### **CIRAS Mission Statement**

*The mission of CIRAS is to enhance the performance of Iowa industry and associated entities through education and technology-based services.*

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# Center creates new uses for Iowa's crops

By Sunanda Vittal, Engineering Communications and Marketing

**N**o grain should leave the state without adding value to it" is the vision espoused by the Center for Crops Utilization Research (CCUR). "Why should we export raw commodities that add value to economic activity elsewhere, when we can reap the benefits in our own state?" asks CCUR Director Larry Johnson, underscoring the center's other important agenda: namely, to make Iowa "the preferred location for processing traditional commodity grain and producing, marketing, and processing value-enhanced grain."

Established in 1987, CCUR is a multidisciplinary research, development, and technology transfer program at Iowa State University, whose primary focus is developing new processes, products, and markets for corn, soybeans, and other Midwest crops. Its guiding philosophy is to capitalize on Iowa's pre-eminence as an agricultural state. The center strives to improve American agricultural competitiveness by fostering a basic understanding of crop properties and using the information to develop new food, feed, and industrial biobased products.

The center has a broad-based clientele, from university researchers to start-up companies to individual entrepreneurs, who use its 35,000-sq.-ft., state-of-the-art pilot plant facility to investigate and develop innovative manufacturing and/or production technologies. Currently, 14 departments across five colleges at ISU, involving over 40 faculty and staff, use CCUR labs and services for advanced utilization and biobased research. Technology development activities at CCUR occur at different levels, explains Johnson:

- CCUR facilitates company-specific projects. The on-site pilot plant facility is available to companies and manufacturers for proof-of-concept and technology transfer activities. Individuals and companies can use this facility anywhere from a period of a few hours to several years for long-term research projects. Companies can either test or develop new products and processes in collaboration with university researchers or opt *not* to have outside parties involved as a way to retain intellectual property rights.
- CCUR clients include large-scale industries like Cargill and ADM, as well as smaller groups such as farmer cooperatives in search of niche markets for their unique products. Recently, CCUR assisted a group of Benton farmers, who had invested in a mini-soybean plant and wanted to develop an innovative processing technique. "The pilot plant facility allowed farmers an opportunity to better understand the technology and subsequently convert their products into valuable ingredients for food processors," says Johnson.

- A third type of client is the individual entrepreneur. "We understand their unique status as risk-takers and the challenges they face in coming up with capital," says Johnson. CCUR assists entrepreneurs in identifying funding opportunities and resources and works with them to make their products market-ready.
- CCUR also works with small businesses through its small business incubator program. Resident businesses are accommodated for relatively short periods of time (up to two years) to network with faculty and access expertise and other services. These companies receive assistance so that they can develop successful, permanent off-site operations.

*CCUR features advanced equipment for wet processing, dry processing, fermentation and product recovery, hazardous solvent extraction, industrial product development, food preparation, and consumer and sensory testing.*



While its capabilities are extensive, CCUR's singular focus, states Johnson, lies in the area of grain and plant processing. The center is the only one of its kind in the world that concentrates exclusively on developing ingredients that go into food, feed, and biobased products. "Our focus is fractionation, physical and chemical conversion, and *making* the ingredient, as opposed to finished food," says Johnson. Areas of excellence are in soy protein and starch chemistry utilization, soy foods, fats and oils chemistry and processing, and plant and grain fractionation.

Iowa's biobased products and biorenewables industry has enormous growth potential, says Johnson, especially in emerging areas of crop utilization for industrial chemicals, biocomposite construction materials, and pharmaceutical products. CCUR research will continue to facilitate this growth through advances in crop processing, recovery, and purification technologies, he added, as it seeks to create high-value products for farmers and the consumer market. ■

*For more information, visit the CCUR Web site at [www.ag.iastate.edu/centers/ccur](http://www.ag.iastate.edu/centers/ccur) or contact Larry Johnson at [ljohnson@iastate.edu](mailto:ljohnson@iastate.edu); 515-294-0160.*



## Fall course offerings

By Ron Cox, Interim EDE Director

Working technical professionals interested in expanding their educational goals have many options to choose from this fall through Engineering Distance Education (EDE). EDE's flexible on-line delivery makes it convenient for students to take ISU College of Engineering courses anyplace, anytime.

EDE offers courses as non-credit, professional development, and certificate and graduate degree programs. Iowa State University College of Engineering graduate degrees can be earned entirely online with emphasis in the following areas:

- Electrical
- Computer
- Mechanical
- Systems

- Information Security
- Industrial Manufacturing
- Power Systems
- Durability and Design

A variety of new courses is also being developed in agricultural engineering, virtual reality, nondestructive evaluation, aerospace, human factors in product design, project management, and others. Please check the EDE Web site for frequent updates.

The fall semester registration deadline is August 15, 2003. Off-campus students can take the courses using the Internet (video streaming or downloadable), videotape, or CD. ■

*For a complete list of EDE courses and to register, log on to the Web site at [www.ede.iastate.edu](http://www.ede.iastate.edu), call 1-800-854-1675 or email [ede@iastate.edu](mailto:ede@iastate.edu).*

## IIOF 2003 focus is food processing

By Merle Pochop, CIRAS



The numbers tell the story: 25% of U.S. pork is produced in Iowa. Egg, dairy, turkey, and beef production feature in the top 10 national rankings. And Iowa leads in corn and soybean production. With 25% of the world's most

productive land (Class A soils) as a renewable resource, it is understandable that agricultural production and processing leads in contributing to Iowa's gross state product (GSP) at 10.2% of the total. Other analysis, however, shows that Iowa industry consumed 41% of total energy consumed in 1995, and the rate of energy consumption in terms of percentage GSP is 23.8% higher in Iowa than the national average. Clearly, this is a challenge.

But as large as the contribution of agriculture is to Iowa's economy, it can still see improvement. Improving energy usage efficiency, for example, is clearly one of the key ways that Iowa can maintain and grow its position in agricultural production and processing. At the same time, Iowa needs to use this resource as a springboard for innovation into totally new areas.

Improved efficiency in food processing productivity is the focus of the third year of a U.S. Department of Energy-sponsored study program in cooperation with the Iowa Department of Natural Resources, the Iowa Energy Center, ISU Extension, and CIRAS. The purpose of this effort is to gain input from a broad spectrum of Iowa's food processing industries on ways to improve efficiency. The initial targets for participation, at least in the early stages, are industries

in the areas of wet corn milling, soybean crushing, meat packing, and livestock feed formulation.

The program seeks information on challenges that need to be met to achieve significant improvement in operating efficiencies. Improvements in operations will be studied primarily in the areas of (1) energy efficiency use, (2) productivity improvement, and (3) waste reduction. Throughout the course of this year, the above-mentioned industry partners will form a steering committee to assist in guiding, contacting, informing, and soliciting input from industries.

Next, a series of forums will be created to gather information and accomplish two things: (1) create a vision for what will constitute appropriate measures for improved efficiency within the food processing industry, and (2) generate a roadmap of activities and/or technological advances as a way to achieve the intended goal.

Industry input and information from other sources will then be disseminated via forums, as well as through Internet and Web outlets. This will form the basis for identifying applied and future research areas that can achieve the necessary results. The input gathering phase is a follow-up project to previous activities in Iowa. In its first year, the IIOF program targeted metal casting foundries. Second-year activities focused on technologies associated with biomass and related activities, such as ethanol production. ■

*For more information on this topic, visit the IIOF Web site at [www.ciras.iastate.edu/iof](http://www.ciras.iastate.edu/iof) or contact Merle Pochop at 712-274-0048, [mpochop@ciras.iastate.edu](mailto:mpochop@ciras.iastate.edu).*

## Contracting with the federal government: Commercial items

*Getting Started (Part II)* By Rodney Grandon, Patton Boggs LLP

As noted in Part I (see CIRAS News, Spring '03), there has never been a better time to do business with the federal government. As the commercial sector heads into recession, federal spending on goods and services is poised to surge, and it already amounts to hundreds of billions of dollars each year. Unfortunately, many businesses are missing out on potentially profitable opportunities because of the perception that contracting with the federal government is a burdensome and unpleasant experience. While there remain certain unique aspects to doing business with the federal government, it has in recent years become remarkably similar to what businesses should expect to experience in a typical commercial transaction. This is particularly true in procurements for commercial items.

Part I of this three-part series addressed the competition requirements that govern most federal procurements. Part II focuses on the solicitation and award of federal contracts.

### **Solicitation and award of federal contracts**

The federal government generally uses one of two fundamental approaches to solicit offers and award contracts: (1) sealed bidding, and (2) contracting by negotiation. Contracting opportunities, including solicitation announcements, can be identified through links included at most federal agency Web sites (e.g., [www.defenselink.mil](http://www.defenselink.mil) and [www.gsa.gov](http://www.gsa.gov)).

### **Sealed bidding**

The basic requirements for contracting for supplies and services by sealed bidding are set forth in FAR Part 14. Sealed bidding is a method of contracting in which the government solicits competitive bids. After a specified period, those bids are publicly opened and an award is made, usually to the lowest-priced responsive, "responsible" bidder. ("Responsibility" is a term of art in federal contracting. It refers to the contractor's ability to perform the contract in terms of available production capacity, suitable financing, adequate labor, etc.).

Sealed bidding is regarded as an appropriate procurement tool when the agency does not believe that negotiations will be necessary to secure a fair and reasonable price for the required supplies or services. This usually occurs when the government is able to precisely describe the products or services it seeks to acquire, and where award will be

made on the basis of price or price-related factors, as opposed to more subjective considerations relating to the perceived superiority of the products or services offered.

The procedures relating to sealed bidding are rigid and are designed to impose a set of common rules on all bidders. After publicizing its requirements in the Commerce Business Daily (a daily publication issued by the federal government), and now on most agencies' Web sites, the government issues an Invitation for Bids (IFB). The IFB specifies the required supplies and/or services, the rules and provisions governing the procurement, and the applicable contract clauses in the event of award. The IFB also will establish a specific date and time at which

bids will be opened. If the bidder does not closely adhere to the rules stated in the IFB—including rules relating to how the prices should be stated and the time for submitting bids—the government generally has little choice but to reject the bid. At bid opening, the bids are publicly opened and the prices are disclosed, the lowest priced bid is identified, and award is made to the lowest-priced responsive, responsible bidder.

### **Breakfast, Business & More July Showcase**

July 10, 2003  
Downtown Holiday Inn-Tower Room  
Des Moines  
Breakfast 7:00–8:30 a.m.  
Showcase: 8:30–12:00 p.m.  
For reservations and information,  
contact Kathy Bryan, (800) 458-4465;  
[kbryan@ciras.iastate.edu](mailto:kbryan@ciras.iastate.edu)

### **Contracting by negotiation**

Negotiated procurements (FAR Part 15) offer the government and the contractor greater flexibility in reaching agreement on the required supplies and services. Like sealed bidding, the government publicizes its requirements in the Commerce Business Daily and on the procuring agency's Web site. Subsequently, the government issues a Request for Proposal (RFP) that details its requirements, states the rules and provisions governing the procurement (including the factors that will govern the government's evaluation of the proposals), and identifies the clauses applicable to any resulting contract. The offerors must then submit their proposals by a common cutoff date, after which the government will engage in negotiations with each offeror, unless the RFP expressly permits the government to award on the basis of initial offers. Negotiations may be nothing more than notice that the government has not identified any deficiencies or weaknesses with a particular proposal, or negotiations may involve extensive rounds of technical and price discussions. After the completion of negotiations, offerors are given the opportunity to submit revised proposals by a common cutoff date. The government then makes an award decision based on the revised proposals.

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## Productivity paves the way

*The ten-year period between 1983 and 1992 witnessed a flurry of inquiries by manufacturers and businesses eager to explore and apply new technologies and processes to improve productivity.*

A CIRAS technology and research needs survey conducted in 1984 revealed that Iowa's manufacturers rated research and technological advances of significant importance in their operations. This view led to increased industry/university partnerships and technology transfer programs that, today, are a staple of CIRAS services.

Through regular newsletters and information sessions, CIRAS introduced manufacturers to computerized machine tools, laser technology, and the flexible manufacturing system (FMS) or the ability to produce a variety of parts using the fewest number of machines. In the mid-1980s, CIRAS conducted over 40 productivity audits to identify ways productivity could be enhanced by employing advanced technologies, materials, and processes. The audits also gave companies ideas on how to improve product design and achieve an increased market share, especially in international markets.

CIRAS kept Iowa manufacturers informed on technological innovations in ultrasonic devices for materials imaging, mass spectrometry, animated computer simulations, infrared analyzers, product testing, and biotechnology applications, including value-added crops. In 1986, CIRAS received two grants from the Iowa legislature to study the economics of ethanol production. In 1987, Governor Terry Branstad established CIRAS as a National Aeronautics and Space Administration (NASA) industrial application center, giving companies access to NASA's technical database and trained computer experts.

Developing a quality workforce was another absorbing concern. CIRAS staff helped manufacturers investigate new

approaches in employee training programs and problem-solving strategies. CIRAS also worked with Iowa industry on financial management, marketing, and business development issues. In 1986, it organized six statewide seminars on industrial lending in collaboration with the Small Business Development Centers of Iowa and the Iowa Development Commission. During this same period, CIRAS staff offered business plan seminars, budget and cost-analysis workshops, and numerous hands-on sessions for start-up businesses, plant expansions, and product-enhancement ventures.

### Mark your calendars!

#### CIRAS' 40th Anniversary

September 11, 2003  
1:00–3:00 p.m.  
Howe Hall  
Iowa State University

*Join CIRAS staff, students, and guests for a special commemorative event. Log on to [www.ciras.iastate.edu](http://www.ciras.iastate.edu) for information on planned activities for this occasion.*

CIRAS continued to expand its state and university programs network. The Iowa Procurement Outreach Center (IPOC) was initiated in 1986 in Cedar Rapids to offer counseling and technical assistance to firms that wanted to provide goods and services to the federal government. CIRAS also extended its international visibility by opening up an exchange program with China's Hebei province, with a view to settling up potential markets in China.

Marking CIRAS' 25<sup>th</sup> anniversary in 1988, Director David Swanson observed that, in its quarter-century existence, CIRAS had handled more than 25,000 projects, establishing over 130,000 contacts with Iowa's 4,000 manufacturing firms. In the same year, CIRAS received two NAMTAC awards for program excellence.

Finally, the early '90s saw the beginnings of CIRAS' facilities planning services. Today, CIRAS assistance in layout and material handling has proved invaluable for start-up businesses and companies focusing on growth and expansion.

**CIRAS**  
Through the years

1983–1992

#### 1983

- conducts quarterly economic survey to aid manufacturers

#### 1984

- launches the Minority Business Development Program, a training and education program for minority businesses.

#### 1985

- updates booklet of ISU graduates abroad to help Iowa export sales

#### 1986

- conducts productivity audits with EDA grant
- conducts workshops on preparing business plans

- wins first NAMTAC Award for operating the Iowa High Technology Council

- surveys manufacturers on their technology and research needs

- offers seminars for bankers on industrial loans

- provides technical and business information to manufacturers through an interactive data link program

- helps Iowa firms access information on China by consolidating materials such as product catalogs, technical journals, and trading company information

# Lighting giant 'glows' with CIRAS help

By Sunanda Vittal, Engineering Communications and Marketing

**M**usco Lighting Company is a heavyweight in the world of large-scale sporting events and entertainment. Headquartered in Oskaloosa, it specializes in the design, manufacture, and installation of permanent and temporary lighting systems for both indoor and outdoor recreation arenas and athletic fields.

For over 25 years, Musco's state-of-the-art technology has lit up a host of playing fields from neighborhood ballparks to high profile events such as NCAA football telecasts and NASCAR night racing broadcasts, including its biggest event—the Daytona International Speedway.

In 1982, Musco made television history by taking sports lighting on the road with Musco Mobile lighting systems when it broadcast the Notre Dame-Michigan primetime football game. On September 11, 2001, Musco contributed its remote-controlled lighting system for search and recovery efforts at the World Trade Center and the Pentagon. And, in 2002, its lights shone down upon the International Tennis Master's Cup in Shanghai, China.

While Musco illuminations have reached the far corners of the globe, its early history grew out of critical business decisions taken back home that relied on timely consultations held with CIRAS.

Musco President Joe Crookham remembers the days when the company was considering buying Muscatine Lighting Company in 1976. "We had the necessary expertise to get started in areas such as engineering, manufacturing, and accounting," Crookham recalls, "but lacked experience in understanding supplier-competitor relationships and choosing alternative opportunities and directions."

CIRAS assistance during this period was "incredibly important," says Crookham. Consultations with Industrial Specialist Bob Lyons led to a systematic evaluation of available options at the time. "The discussions provided an important understanding of our direction and access to other businesses," states Crookham—information that "directly led to the acquisition of Muscatine Lighting



*Joe Crookham stands between two types of 'Mirtran' lighting systems, an example of Musco's innovative line of products.*

and Manufacturing Company, renamed Musco," he adds. Lyons brought many ideas to the table. "It was from these conversations that we found and selected Musco as a business opportunity," says Crookham.

Sound advice at a critical juncture has delivered its own returns over the years. Musco continues to develop innovative, cost-effective, energy-efficient, and environmentally sound systems. New products on the market include an efficient reflector and lamp design technology combined with a Web-based management control system that allow city planners and facilities managers flexible and energy-efficient control of their lighting needs.

"Anyone starting a business or operating with limited personnel would be well advised to utilize CIRAS," advises Crookham. "We have been fortunate to be able to grow on a steady basis for over 25-plus years," he reflects. "CIRAS helped us achieve a balanced understanding of our business that enabled us to make good choices along the way." ■

## 1987

- is established by Governor Branstad as a NASA industrial application center affiliate

## 1988

- begins using CAD software for engineering drawings

## 1989

- assists Iowa Department of Transportation with waste oil study

## 1991

- helps Iowa manufacturers with facilities planning services

## 1990

- conducts 700 data searches for Iowa manufacturers

## 1992

- launches county meetings to discuss manufacturing issues and encourage networking of manufacturers

- equips field staff with computers for data searches

- receives two NAMTAC awards for program excellence

- directs Iowa manufacturing conference dealing with technology and management

- administers two state grants to research the economics of ethanol production from corn



## Student research consolidates manufacturing facts



*Ron Cox, left, and Jen Diaz discuss Iowa manufacturing facts.*

Over the course of two semesters, ISU junior Jen Diaz has been busy collecting and compiling data. Her CIRAS project, supervised by Director Ron Cox, has focused on gathering information on all aspects of Iowa manufacturing.

“This was done to compare and contrast the different industries, both manufacturing and others, to see where concentrations lay and explain why these industries exist in the numbers they do,” says Diaz.

The information is now accessible on the main CIRAS Web site ([www.ciras.iastate.edu](http://www.ciras.iastate.edu)) through a link titled ‘Manufacturing Data.’ Here, graphs, maps, and charts interpret and illustrate the current state of manufacturing, as well as its relative ranking to other industries in Iowa.

Color-coded maps show densities in employment and allow a comparison of geographic location of population, highways, and natural resources. The site also provides additional information on key industries as well as links to state and national manufacturing resources.

The task has not been without some challenges, says Diaz, whose job was to correctly identify and include only current data in her research. At times, she also had to resolve issues in geographic and mailing locations for some companies. By thoroughly re-examining the data, however, Diaz and Cox were able to arrive at accurate and reliable information.

A native of El Paso, Texas, Diaz is majoring in economics and political science. She is pleased with the skills she has gained in using Microsoft programs such as Visio, FrontPage, and Access. She says she has also learned to both ask the right questions and share the data confidently with users.

*For more information or to schedule a presentation, contact Ron Cox at 515-294-9592; [rcox@ciras.iastate.edu](mailto:rcox@ciras.iastate.edu).*

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### Commercial items

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Unlike sealed bidding, the government is not obligated to award the contract to the lowest-priced responsive, responsible offeror. Instead, the government may make an award to a contractor other than the low offeror. This is done through a price/technical trade-off, i.e., the government may pay a premium for a product or service provided the government can reasonably establish that it is getting a better value. Not surprisingly, this type of a negotiated procurement is known as “best value” procurement.

As a means of fostering competition, and to limit the government’s discretion in the price/technical trade-off, the government must conduct a “best value” price/technical trade-off in strict accordance with the evaluation factors stated in the RFP. These evaluation factors must advise the prospective offerors of the considerations that will go into the award decision, as well as the relative value of each of the considerations. For example, if the major evaluation factors include technical merit, quality, and price, the government must state this.

Furthermore, the government must specify the relative importance of these factors (e.g., technical is significantly more important than quality and price; quality is more important than price; if all other factors are equal, the lowest price offer will be accepted). Obviously, this process introduces flexibility for the government and elements of salesmanship on the part of the offeror (i.e., how well can the offeror describe the capabilities of its products or services).

The government’s current approach to negotiated procurements—best value—provides further opportunity for businesses offering quality products and services to compete for federal contracts. ■

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# Iowa State's WiST lab offers range of applications

By Fred L. Haan, Jr., ISU Department of Aerospace Engineering

Somewhere an engineer must determine the wind load on the roof of an unconventional, new building design. Somewhere a plant scientist is concerned with how well a particular plant will withstand storm winds in the field. And, somewhere, an engineer is designing accessories for cars and trucks and must determine how much they will increase a vehicle's drag.

In each of the cases above, these engineers need wind tunnels. While most people associate wind tunnels with aircraft development or NASA, researchers at Iowa State University developed the facilities at the Wind Simulation and Testing (WiST) Laboratory with a broad range of applications in mind. These facilities accommodate aerospace engineering work as well as a broader range of applications known as wind engineering. While design codes provide guidelines for wind forces in many cases, a given design can often raise questions that the code cannot answer. In these cases, wind tunnel testing is a versatile tool for determining wind forces on a structure.

In the field of wind engineering, researchers can use wind tunnel models of buildings, towers, and other structures to obtain estimates of aerodynamic loads due to wind. Measurements can include not only overall aerodynamic forces but also the pressures at individual locations on a structure. A designer can use this information to specify overall structural loading and to identify requirements for individual building cladding items such as windows or roofing materials. Engineers and scientists can also use wind tunnels to observe full-size plants or plant models in realistically simulated wind.

## **What information can you get from a wind tunnel test?**

Sometimes the information needed from a wind tunnel test is simply how the wind flows past a particularly complex geometry. This complex geometry could be anything from a field of crops to a walkway near a new building. "Flow visualization" is a common activity for wind tunnel studies and involves injecting some form of smoke or mist into a wind tunnel flow to visualize the wind patterns. The resulting videos or pictures of the flow

patterns can be very helpful in designing parts for better aerodynamic performance.

If flow speeds must be quantified, the WiST lab is equipped with the latest technology for measuring wind speed. A wind tunnel, for example, can be used to accurately measure wind speeds in and around models by inserting probes into the flow field or using non-intrusive laser imaging techniques. Similarly, wind speed measurements are important in environmental studies of pedestrian-

level winds, snow drifts, and air pollution, and in agricultural studies on plant stress and soil erosion.

Many applications require measurements of aerodynamic drag force. The WiST lab has several types of sensors to measure both single and multiple components of force and torque. Projects that might require force measurements include designs for light poles, towers, buildings, vehicles and vehicle accessories, and sports-related items such as race cars, sails, and sportswear. To measure

forces in a specific location on a model, pressure sensors can be used. In this instance, small pressure taps are drilled into a model and tubing from the taps is connected to pressure sensors.

Some types of structures are flexible and are susceptible to flow-induced vibrations. Wind tunnel studies of these types of structures require accelerometers or motion measurement sensors. The WiST lab has a variety of sensors for such work as well.

## **What kinds of wind tunnels does Iowa State have?**

The WiST lab contains conventional wind tunnels and next-generation facilities that advance the state of the art. The smallest wind tunnel has a cross section of 1 ft. by 1 ft. and can reach wind speeds of 150 mph. A larger wind tunnel has a cross section that is 3 ft. wide by 2.5 ft. high and can generate wind speeds of 180 mph. These two are conventional tunnels typical of most aerodynamic testing facilities.



*ISU Assistant Professor Fred Haan at the WiST lab in Howe Hall.*

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## Engineering courts business in master's degree program

While an engineering background is considered a must in manufacturing, increasingly companies are finding that broad-based management skills for employees are also indispensable to a company's overall success.

A unique degree program, set up through Iowa State University's College of Engineering and the University of Iowa's Henry B. Tippie School of Business, is currently addressing this critical need to incorporate business concepts into engineering fields. The UI's Executive M.B.A. program and ISU's systems engineering master's program have combined to create the Executive Engineer Dual Master's Degree Program, designed to give professional engineers the knowledge they need to meet today's business environment.

Launched in October 2000, the program graduated its first class of 31 students last December. They included engineers, managers, and supervisors from companies such as John Deere in Waterloo and Square D and Rockwell Collins in Cedar Rapids.

The program is set up in executive format. Students take classes as a group and work on projects in teams. Classes and study groups meet once a week. In addition, the program includes a week in residence at both Iowa State and Iowa, along with a 10-day trip abroad. The curriculum

covers core areas in statistics, systems engineering fundamentals, marketing, managerial economics, financial accounting, managerial finance, and systems effectiveness.

The program fee is all-inclusive and covers tuition, books, supplies, computer software, parking, group luncheons, the two-week on-campus residency program, and an international trip. Students pay for transportation to class and airfare for the ten-day international trip.

Graduates get degrees from both institutions—an engineering master's degree from Iowa State and an M.B.A. degree from Iowa. An undergraduate degree in engineering is a prerequisite for the program.

Participants have found the program worthwhile for many reasons. The blend of business and engineering, they say, has helped them learn more about how to create and finance a business plan. Some have expressed the value gained from working with international companies, while others report that just learning the 'language' of business was useful in contributing to marketing decisions.

*For more information on the Executive Engineer Dual Master's Degree Program, visit the Web site at [www.eng.iastate.edu/dual-degree/index.html](http://www.eng.iastate.edu/dual-degree/index.html) or call 515-294-8731.*

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### WiST laboratory

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By November of 2003, the lab's largest wind tunnel will be operational. Significantly larger than the first two, this wind tunnel has a cross section that is 6 ft. high and 8 ft. wide and a maximum wind speed of 110 mph. It also has a gusting capability, making it the only one of its kind in the world. By August 2003, the tornado simulator will also be operational. This facility will be able to simulate tornado-like vortices and thunderstorm downburst events. These two facilities will give the WiST laboratory severe weather simulation capabilities that do not exist anywhere else in the world.

The WiST laboratory is part of the Department of Aerospace Engineering and contains a dedicated shop for model building and wind tunnel support. Dr. Partha Sarkar (laboratory director) and Dr. Fred Haan conduct work in the lab. Together, they bring over 20 years of wind engineering experience from a host of diverse projects to their research. ■

*For more information on how the WiST laboratory at Iowa State can assist Iowa manufacturers with their wind testing needs, contact John Van Engelenhoven, CIRAS, 515-294-4475, [jve@ciras.iastate.edu](mailto:jve@ciras.iastate.edu).*

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### Mohr earns PE license



Jeff Mohr recently received his Professional Engineer's license in the discipline of industrial engineering.

Mohr graduated with a bachelor's degree in industrial engineering from Iowa State in 1997 and received a Jonah certification in the same year from the Avraham

Y. Goldratt Institute, New Haven, Connecticut. He joined CIRAS in 1998.

Mohr's interests are in the areas of project management, noise control, human factor, and product development. His experience includes direct involvement in many aspects of plant operation, including material handling, shipping and receiving, fabrication, and assembly. Mohr also has extensive experience in human resource management, inventory control, and loss prevention as a retail manager for 11 years.



*From left, John Van Engelenhoven; Clay Crandall; Earl Perentis, Mastercraft; and Bob Coacher, IMEP, at the Mastercraft plant in Council Bluffs.*

#### **Mastercraft**

**Continued from page 1**

of 130,000 square feet of floor space to a new plant with 66,000 square feet. To deal with the space reduction, Nadler worked with Crandall and CIRAS Industrial Specialist John Van Engelenhoven on a plant simulation and layout process that could help Nadler predetermine ways the company could modify operations and at the same time achieve maximum productivity.

Prior to moving, Nadler had studied traffic patterns as well as equipment layout and assembly formation within individual departments at the Omaha facility. Van Engelenhoven and ISU industrial engineering senior Nick Burns then collected data and information on work centers, space, product flow (routing), and material handling for use with FactoryFlow, a computer simulation program that simulates product flow throughout the factory.

A baseline model was established for the existing plant, against which proposed layouts for the new plant were compared. The CIRAS model helped Nadler evaluate the proposed layout and develop an efficient system that better utilized the space and at the same time improved product flow.

"Plant simulation provides a systematic, cost-effective means of evaluating layout scenarios, using part routing and material handling information," explains Van Engelenhoven.

"The plant layout helped significantly when moving because we could basically place the equipment where we had laid it out," notes Nadler. Additionally, it reduced the moving time to less than a week. Crandall provided additional assistance in re-fitting machinery to suit the new conditions.

Currently, the new floor plan brings "everything closer together, making it much more efficient," says Nadler.

## **Partners get the job done**

The Mastercraft project is a telling example of how local- and state-funded groups connect and share resources to help businesses and manufacturers realize their goals. Here is a brief guide to how these units function:

- IMEP is a statewide network of technical and business assistance to small- and mid-sized manufacturers. IMEP account managers conduct assessments in a variety of areas from quality inspections and materials engineering to product design development, market development, and environmental studies that identify areas for improvement. IMEP functions as an intermediary between manufacturers and various support organizations such as community colleges, business and industry groups, academic institutions, and local, state, and federal economic development units.
- IWCC is one of several community colleges statewide that offer economic development services for business and industry. IWCC programs include services in new ventures assistance and planning, customized training and consulting, industrial new job training, and a waste exchange program, to name a few.
- CIRAS partners with IMEP to provide individualized technical assistance to Iowa's 5,900 manufacturing establishments.
- Local and state business and economic development engines, in this instance the Council Bluffs Chamber of Commerce, provide direction and options for companies looking for technical service and financial assistance programs for setting up or expanding an enterprise.

"We plan to grow our employee base, and we think we can probably double our sales this year and add another 25 percent the year after," he adds. ■

*For more information on plant layout simulation or working with Iowa's economic development agencies, contact John Van Engelenhoven at 515-294-4475, [jve@ciras.iastate.edu](mailto:jve@ciras.iastate.edu), or Clay Crandall at 712-366-7070, [ccrandall@ciras.iastate.edu](mailto:ccrandall@ciras.iastate.edu).*



## **New Advisory Council member**

Roger Stokings is president of Blue Wave Ultrasonics, makers of industrial ultrasonic cleaning applications, which is located in Davenport.



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Check out pages 6 and 7 for a historical CIRAS timeline.

## WebWatch: Improving total systems

[www.ciras.iastate.edu](http://www.ciras.iastate.edu)

Whether it's improving profits or the quality and consistency of products and services or just reducing costs, manufacturers always strive to increase productivity.

Productivity issues can be addressed by asking some key questions:

- What is Lean manufacturing?
- What can plant layout simulations achieve?
- Can improving material handling make a difference?
- What is TOC 101, and how can it help?

To learn more about these concepts, log on to the CIRAS Web site at [www.ciras.iastate.edu](http://www.ciras.iastate.edu) and click on 'Productivity.'



## Focus: Productivity

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